A NEW BIDENS FROM THE MERRIMAC VALLEY.

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(Plate 45, figures 11–20.)

IN September, 1902, Mr. Alvah A. Eaton sent to the Gray Herbarium a Bidens which for some years he had vainly attempted to reconcile with descriptions. Mr. Eaton's plant occurred on brackish shores of the Merrimac River above Newburyport, and, though in habit and in the shape of its heads it strongly suggested *Bidens bidentoides* of the lower Delaware River, its shorter heads and achenes and shorter stouter awns prevented its identification with that local species.

The plant was so unlike any Bidens known to the writer, that arrangements were made with its discoverer for a visit to the station on October second. But since the tide at mid-day was so high that the back-flow of the river covered the brackish shores above Newburyport, the original locality of the plant was inaccessible before late afternoon. In the meantime, however, the marshes on the Salisbury side of the river were explored. There on the brackish margins of streams whose banks are overflowed during high-tide were *Bidens cernua*, *B. connata* and *B. frondosa* and occasional colonies of the strange Bidens previously known from above Newburyport. In foliage the plant somewhat resembled *B. connata*, but while that species as well as *B. cernua* and the pinnate-leaved *B. frondosa* invariably had broad hemispherical heads, the plant which had led us to the muddy shores was readily distinguished by its cylindric or narrowly oblong heads. Later in the day, on the muddy shore above Newburyport where Mr. Eaton had first detected the plant with cylindric heads, it was found maintaining its habital character as it had done by the pools in Salisbury.

A detailed study of the material then collected has shown that the plant of the Merrimac shows affinities with *Bidens connata*, *B. comosa* and *B. bidentoides*.

From *Bidens bidentoides* the Merrimac plant is distinguished by its shorter heads, its much broader achenes and its shorter awns. From *B. connata* and *B. comosa* as already stated it is readily distinguished by its narrow elongate heads, but to both these species it approaches in certain other characters. As in *B. connata* the inner bracts of the

involucre are as long as the disk, but in this they differ strikingly from *B. comosa* whose broad flowering disk much exceeds the inner involucre. In its achenes the Merrimac plant is somewhat intermediate between *B. connata* and *B. comosa*. The achenes of the former are rather tetragonous in section, the ribs on the two faces being very conspicuously thickened and keel-like; and the inner achenes are 4.5 to 6 mm. long. In *B. comosa* the achenes are flat and essentially nerveless, the innermost 8 or 10 mm. long. The achenes of the cylindric-headed plant of the Merrimac shores are essentially flat, but they usually have a well defined though narrow mid-rib on each face, and the innermost achenes from 7 to 9 mm. in length. Thus in its achene the Newburyport and Salisbury plant stands between *B. connata* and *B. comosa*, though it differs from both in the shape of its head in which character it strongly simulates the local and otherwise unique *B. bidentoides*.

The awns of *Bidens bidentoides* are upwardly barbed, instead of with the retrorse barbs which are ordinarily associated with *Bidens*. On this account the plant of the Delaware flats was long supposed to be a Coreopsis. Similarly when in 1866 A. H. Smith found near Philadelphia a plant resembling in all other characters *Bidens frondosa*, but with the awns upwardly barbed, the plant was supposed to be a hybrid between *Coreopsis bidentoides* and *Bidens frondosa*, and was later referred to by Dr. Gray as "doubtless a hybrid."[1] Subsequently however, a plant quite identical with the Delaware River material has been found as far east as Cape Breton Island (Macoun, no. 19,168), fully 800 miles from the nearest *Bidens* (*Coreopsis*) *bidentoides*, so that the hybrid origin of the plant seems quite out of the question. This extreme of *B. frondosa* with upwardly barbed awns may be called var. *anomala*, Porter, a name under which the plant was distributed by the late Thos. C. Porter.

Dr. N. L. Britton has recorded[2] the occurrence of downwardly barbed awns in *Bidens discoidea* which commonly has the barbs ascending, and Dr. K. M. Wiegand has recorded[3] upwardly barbed awns in *B. connata*, concluding that such variations are rarely or never due to hybridization. In view of these exceptional tendencies already observed in the related species of *Bidens* it was interesting to

[1] Syn. Fl. i. pt. 2, 296.
[2] Bull. Torr. Bot. Club, xx (1893) 280.
[3] Bull. Torr. Bot. Club, xxvi (1899) 400.

find that many of the plants from the Merrimac shores have the awns upwardly barbed. In the examination of hundreds of heads it has been found that with the exception of one single specimen all the achenes of an individual plant have similarly barbed awns. The material at hand shows that the Delaware River *B. frondosa*, var. *anomala* is likewise essentially constant in its single morphological character, although as in the Merrimac Valley plant it shows no other feature by which it can be distinguished from the more usual form.

It is a striking coincidence that the habitat of *Bidens frondosa*, var. *anomala* and *B. bidentoides*, on brackish mudflats at the mouth of the Delaware River, should be so closely simulated by the brackish shores of the lower Merrimac where alone the plant discovered by Mr. Eaton has been found. *B. frondosa*, var. *anomala*, as already stated, however, has recently been found in Cape Breton and it is probable that the others will eventually prove to be of less restricted distribution than is at present known.

The plant of the Merrimac shores first detected by a botanist whose keen observation is adding materially to our knowledge of a remarkable botanical area, may appropriately bear his name:—

BIDENS **Eatoni**. Annual, simple or freely branched, 2.5 to 6 dm. high: leaves simple, lanceolate, with long-acuminate tips and slender petiolar bases, coarsely and often deeply serrate, 5 to 15 cm. long: heads erect, cylindric or oblong, in fruit becoming obovoid, longer than broad: outer involucre usually of 3 to 5 foliaceous bracts slightly exceeding the disk: inner involucre mostly of 5 oblong blunt or barely mucronate conspicuously striate bracts about 1 cm. long, equalling the disk: rays none: disk flowers 15 to 25: achenes flattish; the inner 7 to 9 mm. long, 1 to 1.7 mm. broad, with well developed but narrow midribs, linear-oblanceolate, usually with retrorse hairs on the margins; awns 2 to 4, downwardly barbed, the marginal longest, 3 to 4.3 mm. long, about equalling the pale yellow corollas. — Brackish shores of the Merrimac River, Newburyport, Massachusetts, Sept. 1902 (*A. A. Eaton*), Newburyport and Salisbury, Oct. 2, 1902 (*A. A. Eaton & M. L. Fernald*).

Var. **fallax**. Achenes and awns upwardly barbed.—With the species, but essentially constant in its single morphological character.

EXPLANATION OF PLATE 45, Figs. 11–20. — *Bidens Eatoni*: Fig. 11, portion of flowering plant; fig. 12, outer achene; fig. 13, inner achene. *B. Eatoni*, var. *fallax*: Fig. 14, inner achene. *B. bidentoides*: Fig. 15, flowering head; fig. 16, inner achene. *B. connata*: Fig. 17, flowering head; fig. 18, inner achene. *B. comosa*: Fig. 19, flowering head; fig. 20, inner achene.

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